Institutions, regulations and sustainable transport, a review

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This policy research document examines institutional and regulatory aspects of sustainable transport from a cross- national perspective. While institutions appear to play an important role in the economic success of many countries, it is not so clear that they also support sustainable development. In fact, institutions are probably both supporting and constraining depending on the situation and it remains unclear what the net balance is. A number of examples of the role of institutions in transport are discussed. A research agenda is formulated with special attention to among others success and failure factors for regulatory reform, private versus public roles in transport, border effects and issues of fiscal competition.

1. Introduction

Transport in any country is a complex system composed of the infrastructure, logistics and information systems that manage and direct the actual movement of vehicles, ships and airplanes. Such transport systems and related markets have an international dimension. For example, there are only two large suppliers to the global market for airplanes. Further, most infrastructure networks such as railways and highways have an international orientation and given the increasing distances at which spatial interaction takes place, a growing share of the flows of passengers, freight and information cross national borders. This tendency towards internationalization calls for increasing coordination of activities in and among countries. Despite the international character of transport, countries differ substantially in the routines used to deal with transport problems. These differences are related to factors like the differences in physical and geographical condition -low density countries tend to have different transport

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problems than high-density countries- and economic development as high income countries usually put greater emphasis on the environmental impacts of transport than low income countries. Another reason for differences among countries is that institutional arrangements differ. For example, it can be demonstrated that there are fundamental institutional reasons why in Europe rail is important for passenger transport, but rather unimportant for freight transport, whereas it is just the other way around for the USA. The roles assumed by the public and the private sectors vary considerably among countries in general, and between Europe and the USA in particular. In this contribution we analyze these differences in more detail where special attention is directed to the theme of sustainable transport. This policy research document is meant to summarize the contributions and discussions in Focus Group 5 of the STELLA-STAR network.

In section 2 we give a short introduction to the nature of institutions. Institutions and sustainable transport are discussed in section 3. A comparison of the EU and North America is carried out in section 4. Section 5 is on methodological issues and data. Finally, section 6 contains proposals for a research agenda in this field.

2. Institutions

Institutions may be defined as socially devised constraints that shape human interaction (North, 1990). A related definition is to describe institutions as social rule structures. These structures can be both formal and informal. An obvious example of a formal institution is a property right specified by legislation. But there are many informal institutions both within organizations and between organizations. Examples include management practices, governance and rules on who takes the initiative in large infrastructure projects. The essence of institutions is that they structure incentives in human exchange and interaction. A related distinction is due to Williamson (1994) who views institutions as being of four types: informal, formal, governance and resource allocation/employment related.

Institutions, as defined here, are not identical to organizations. Organizations are groups of actors that share a common interest or goal; institutions structure and define the relationships between actors and organizations. Organizations and institutions are often closely linked. For example, ‘higher education’ is the institution corresponding to the university organization. The relationship between ‘governance’ and ‘government’ is similar. Institutions and organizations are mutually related. On the one hand, institutions lead to the emergence and maintenance of organizations. For example, international agreements between governments of countries are often a necessary condition for the existence of international firms. On the other hand, the behavior of organizations may result in institutional change.

Institutions are necessary because they provide the rules that make it possible to maintain law and order and in many countries to ensure a basic level of justice and equity in society. Issues of justice are, however, not the only reason institutions exist. Coase (1937) and North (1990) have called attention to the economic importance of institutions through the concept of ‘transaction costs’: when transaction costs are high, institutions matter. Transactions involve several types of costs such as the search for a supplier, contract negotiations related to measuring or defining the attributes of what is exchanged, and the enforcement of agreements. A high level of transaction cost often implies that transactions that are potentially beneficial will nevertheless not occur or occur less frequently and therefore impact market efficient outcomes.

The importance of institutions, in addition to their justice or equity support role, is that they provide the structure for exchange that determines the cost of transactions and the cost of transformation. For example, laws defining property rights will reduce transaction and production risks. The level of transaction cost will also have a strong impact on the formation of organizations and their structure. For example, large vertically integrated firms may be viewed as a response to high levels of transaction costs between firms.

3. Institutions and transport.

In the following part of the paper we illustrate the role and importance of institutions for transport through a variety of different perspectives. These perspectives or dimensions include sustainability, technology and technological change, production processes and transaction costs, territorial boundaries and equity considerations. While these sub-parts provide interesting insight and sometimes provocative thought, they are not presented in any kind of analytical framework or synthetic typological context. The final two sub-parts attempt to do this but only in a preliminary way. Providing a fully developed framework is the topic of another paper. The first of these sub-parts builds on Williamson's (1994) concept that institutions vary from high level ones that are difficult to change except over long periods of time to lower level ones that are more easy to change and thus change in a shorter time context. The second attempt at providing a framework for synthesis sorts institutions in terms of their level of impact on transport.

3.1 Institutions and sustainability

Economic historians have called attention to the fact that the economic success of a country depends critically on its institutions (cf. North, 1990). For example, political rules including checks and balances, well-defined property rights and an emphasis on impersonal or "weak" ties are usually considered to be important factors explaining the economic success of a country. Thus, institutions matter in the explanation of economic growth. An important question is whether institutions also matter in the achievement of sustainability, and in particular, sustainable transport. Movements towards sustainable transport are influenced by institutional conditions. In some cases these conditions appear to be beneficial, in other cases they appear to hamper favorable development toward sustainability, however. A few examples to illustrate this point are provided below.

- *Technological change* has the potential to make a considerable contribution to sustainable transport. However, institutions may hamper such development. An example is legislation concerning underground transport. When property rights of land below the surface are not well defined, investments in underground transport infrastructure have a higher risk premium.
- *International agreements on taxation* may hamper the introduction of fiscal instruments resulting in undesirable fiscal treatment of transport modes. An obvious example is aviation where fuel taxes for international flights are zero, which is surprising given the local and extra-local environmental effects involved.
- *Mobility rights* can be considered as informal citizen's rights in most countries in the sense that they can travel as much as they like. Thus governments are confronted with difficult challenges. For example the obligation to ensure that the elderly and

handicapped have access to adequate transport services. Another example is that efforts of governments to restrict mobility rights are difficult to realize because citizens often consider them to be violations of fundamental rights such as to park at particular places, to have access to particular zones, or to use certain infrastructures at particular times of the day without a charge.

- *Property rights on environmental quality*. The "polluter pays" principle has been introduced to ensure that pollution is taken into account as a cost component in transport. At the same time it is a principle of equity because it says that it is not the victim that must pay, but the polluter. One of the consequences of this principle is that infrastructure cost has increased substantially because victims request adequate compensation. As the "voice" of the potential victims has become more powerful it has become a substantial decision factor, sometimes even leading to the cancellation of the construction an airport expansion or highway.
- *Taboos on policies.* Transport policies affect the welfare or profit of households and firms that in turn will try to influence these policies. This leads to the development, over time, of political processes with both formal and informal rules constraining the room that governments have to maneuver. Sometimes these limitations acquire the character of a taboo. In the U.S., the political party that dares to increase taxes (fuel or otherwise) will not win the next election. Plans to build large expressways in urban areas that were met with strong and successful resistance in the past will not easily be proposed a second time.

3.2 Institutions and technological change

The potential of technological change to contribute to the development of a sustainable transportation system is considered to be high. Large investments are usually needed for R&D to bring about technological induced change. Institutions such as the granting of property rights of new inventions (patents) are instrumental to further technological development. There is no guarantee, however, that technological change will support sustainability. The major driving force in innovation and R&D is the profit seeking goal of entrepreneurs in response to a potential market demand. When market signals are not sustained, technological change will only by coincidence have a sustainability orientation. Therefore institutions are needed to drive technological change towards sustainable outcomes. As indicated by Geerlings (1999), this may call for government action, not only to correct for environmental effects via taxation policies, but also as a partner in public-private collaboration to facilitate technological change aimed at improved infrastructure.

There is also another side to the relationship between institutions and technological change. On the one hand institutions have an impact on the direction of technological development, on the other, technology affects the structure and form of institutions. Consider for example the technology-related aspect of the non-excludability of various types of transport infrastructure. This implies institutional arrangements for infrastructure supply whereby public sector initiatives are dominant. For example, the emergence of smart cards and electronic tolling has had a strong impact on the transaction costs of infrastructure when the goal is for users to pay. Technology leads to a reduction of transaction costs implying that private suppliers may also become active in the field of infrastructure operations. A broader adoption of information technology will also likely have profound effects on public transport operations. Smart card technology may considerably enlarge possibilities for customers to

pay for transport options in a flexible way, implying new partnership possibilities and roles for public transport operators. Competition between transport modes will more and more be determined by the extent to which ICT applications can be used to increase the quality of these modes.

3.3 Production processes, transaction costs and institutions

The emergence of the vertically integrated firm is a response to high transaction costs, which arise as a consequence of the many transactions between firms producing inputs and intermediate products for non-vertically integrated firms. In the past, the costs of command and control of large and complex organizations limit the growth of vertically integrated firms. Two developments can be observed in this respect. Technological change in the information and communication sectors makes it easier and less costly to control these complex organizations. This has stimulated the emergence of global players in many markets. On the other hand, the disadvantages of large conglomerates have also become evident. Lack of explicit market signals leads to inefficiencies in these large firms. Therefore, outsourcing has become a major recent strategy. As indicated by Fukuyama (1995) in economies where market partners trust each other and institutions are favorable, transaction costs may be low, thus implying an alternative way for organizing the production processes. This means, for example, that there is a growing share of firms that outsource transport and distribution functions. This is a relevant development in view of the sustainability of transport: specialized logistics firms are better equipped to achieve efficient transport performance in many cases. Logistics firms are in a more flexible position to combine shipments, to find demand for return freight and to choose transport modes than are more integrated production-oriented firms that provide their own transport.

Another development is the emergence of just-in-time production processes that has led to new arrangements between subcontractors and outsourcers, and a spatial reorientation of production activities. The introduction of just-in-time production leads to smaller stocks and more frequent deliveries. This may easily increase the environmental burden of freight transport, as the warehouse function becomes part of the transport system.

3.4 Territories, institutions and transport

Formal institutions are an important part of institutional systems. Since governments of nation states have been major actors in creating formal institutions, institutions have some similarity across countries. Two trends can be observed in this respect. On the one hand, in many countries sub national regions have become more independent giving them broader scope to follow their own policies and formulate their own regulations. On the other, supra-national organizations are gaining power. In Europe, for example, this has led to a shift of emphasis in legislation, and thus institutional change, away from national governments and toward the Union.

The institutional and cultural differences between countries are, however, still pervasive. This leads to higher costs for international transactions compared to domestic ones (see Houtum, 1998). Thus, national borders generally have a negative or dampening impact on the intensity of spatial interaction, implying a bias towards domestic partners in transport and transactions. This favors short distance transport patterns, which may be environmentally positive. The increasing importance of the EU may be expected to lead to reduced border friction and thus to broader spatial interaction patterns (Rietveld, 1999, Komornicki, 2005). The resulting

negative effect on the environment may be compensated, as stronger supra-national organizations will be better equipped to impose environmentally friendly transport policies. An example would be the introduction of a fuel tax for international aviation and shipping.
Comparing the USA and Europe, territorial differences are especially interesting because in Europe there are so many countries within the European transport network that additional costs for transport across borders is a historical legacy. One telling example is European air traffic control that is still organized on the basis of the territories of individual countries. This has huge consequences in terms of costs, safety and capacity of the airways. Another clear example is freight transport by rail in Europe, where rail has a much smaller market share than in the U.S. This has to do with the large discrepancies in technology used in the various countries (voltages, equipment, railway security systems, gauge). Another factor is that the influence of the national railway companies in Europe is still very strong, and entry barriers for international railway companies are high, both of which produce negative impacts on the quality and price of international freight railway services.

3.5 Equity rules in transport

Institutions have an important role in safeguarding equity and justice in democratic societies. They also have immediate consequences for sustainability. Consider for example the following list of equity principles that may govern the behavior of actors with respect to transport policies.
An equity concept with considerable appeal is: *transport users should pay their way*. As indicated by Gomez Ibanez (1997) this principle is usually interpreted in terms of average costs implying that the collective of all transport users exactly pays for the aggregate costs. For car users this principle would imply that what they pay in terms of car related taxes should be spent for their benefit in terms of maintenance and construction of roads, surveillance, etc. The sustainability dimension becomes relevant when environmental effects are also included as costs (see, Green et al., 1997): transport users pay their way, including environmental and other external costs.
The well-known *polluter pays principle* has both efficiency and equity implications. The efficiency element is that it incentivises the polluter to reduce pollution to its optimal level. The equity element is that it is not the victim who pays, but the polluter: an alternative principle would be that the victim pays, which would mean that the victim compensates the polluter for measures to reduce pollution. The 'polluter pays principle' has gained wide acceptance in environmental policy. It is nevertheless important to realize that in many negotiations the right to produce external effects is considered to be a property right, and that the introduction of the polluter pays principle leads to negotiations where polluters request compensation. For example, an increase in the tax on diesel fuel because of environmental effects will probably lead to claims from transport companies for compensation in the form of tax reductions in other fields.

3.6 Time scope of institutions

The above sub-parts have provided a diverse set of discussions about the nature of institutions and have illustrated the wide and diverse ways in which they impact transport. Here we build upon the work by Williamson (1994) that, among other things, focuses on the time scope of institutions. He recognized that some institutions are more durable and therefore more resistant to change while others are less so. Below we provide a list of institutional themes

sorted by their durability over time or resistance to change. This list emerged from questionnaires distributed at meetings of STELLA focus group 5.

Long term institutional themes

- Institutional friction hindering cross border flows
- Territorialism and intergovernmental relations
- Barriers to adopting new technology
- Power conflicts among stakeholders
- Barriers to efficient pricing
- Achieving cooperation among actors in view of seamless intermodal transportation
- Decoupling the prestige of owning vs. rational use of the private auto
- Willingness to pay on part of public and users
- Consumer preferences for unsustainable life styles

Short to medium term institutional themes.

- Achieving accountability among public transport operators
- Coping with ambiguous regulations
- Managing intergovernmental relations
- Managing freight and passenger transportation interaction
- Managing interest groups
- Adopting improvements based on research findings
- Goal definitions of organizations
- Land use variances and managing land use and zoning codes

The importance of this initial attempt to sort transport institutions in this way is that it provides insight into the institutional fabric that supports transport development and operations, it suggests some of the raw material required for analyzing transport systems in new ways and it offers some initial elements that would be required for institutional change in the transport sector.

3.7 Direct and Indirect Impacting Transport Institutions

It is important to raise the question of how institutions impact transport: directly or indirectly. Certainly when we define institutions broadly to include not only high level statutes and regulations but also lower level regulations like vehicle standards and transport safety regulations we can see some of the ways that institutions directly impact transport. However, it is not always so clear how higher level institutions like values and culture or lower level institutions from other arenas such as land use or the broader arena of the local or national economy impact transport. Here we offer an initial attempt to bring more insight to the issue of the way in which institutions directly and more indirectly impact transport. This is however no more than an initial attempt to call attention to this issue and to offer some minimal insight. The full development of this perspective is sufficiently broad and deep that it remains as a focus for another paper.

Table 1 presents examples of institutions sorted by whether they directly or indirectly impact the transport sector and by the part of the sector that is impacted, i.e., infrastructure or vehicles.

Table 1. Direct and Indirect Institutions by Transport Infrastructure and Vehicle Categories

Institutions	Infrastructure	Vehicles
Directly Impacting	Values and culture	Values and culture
	Public finance	Vehicle standards
	Public/Private Partnerships	Safety standards
	Privatization rules	Emission regulations
	Environmental Statutes Re. constructions	
Indirectly Impacting	Land-use regulations	Energy regulations
	Equity statutes - Access	Equity statutes
	Form of government, e.g., Unitary or federated	Form of government
	Taxation system	Education system

The further development of this topic would necessarily include a breakdown of the analysis into vehicle types or modes and likewise additional sub-parts for the infrastructure category as there are significant differences in the ways in which road, rail, air, space and fuel types of supporting infrastructures are constructed and maintained. The purpose of this discussion and table 1 is to illustrate an approach that might be followed in building an integrated analytical approach for institutional analysis in the transport sector.

4. International differences: EU versus North America.

Institutional issues often provide an explanation why transport problems are hard to solve within a country or region. They are amplified when more than one country or region is part of the transportation issue because there often is considerable institutional dissonance when countries with their different values, regulations, standards, etc. are involved. This is easily understood as one considers the difference between North America and Europe on various transport related issues, not to mention differences between even the U.S. and Canada! Lipset (1990) provides an incisive analysis of the differences and similarities between the U.S. and Canadian social and political systems. Some examples of the differences between North America and Europe are:

General institutional differences: *North America versus Europe*

- More national borders in Europe
- Lack of uniform “rules” or institutions in Europe despite EU integration
- Decentralized decision making is greater in the U.S.
- Europe is still figuring out integration: many problems derive from this
- Different histories of institutional development, e.g., public-private organizations
- Role of government is perceived differently, American Exceptionalism (Lipset, 1996) vs. stronger welfare state preferences in Europe
- Greater ability of government to implement in Europe
- Privatization approaches are different

Differences in transport related institutions: North America versus Europe

- U.S. is more committed to road use and road access goals
- Europe is more prepared to use transport pricing concepts
- Taxation of fuel is much higher in Europe
- Public transport availability is higher in Europe

Differences in land use: North America versus Europe

- Land use planning has been devolved to minor units of government in the U.S.
- Europe is more densely populated
- Different urban location patterns, e.g., sprawl dominates in the U.S.
- Land use regulation is stronger in Europe
- Differences in consumer preferences with respect to transport:
- Car ownership and lifestyles
- Lower public transport demand in North America
- Barriers to sustainable transport greater in the U.S.

During the meetings of the focus groups these differences have received ample attention and the international comparative perspective adopted was indeed instrumental in the identification of the roles institutions played. Additional work that contributes to and amplifies this part of the paper may be found in Goetz and Graham (2004) and Docherty et al. (2004).

5. Methodological and data issues in institutional analysis

The role of institutions in transport analysis may be viewed in terms of independent variables that help to explain some dependent variable(s) such as traffic congestion, infrastructure investment, operational procedures, policy intervention, or failure to intervene, for example, pricing or privatization. Institutions also may serve as control variables from a planning systems and implementation research perspective. However, the institutional variable is very rich because of its complexity and its multiple forms as described above in the discussion on the institutional typology. Consequently, institutions tend to be seen as "softer" and more difficult to quantify variables compared to other variables typically used in transportation analysis. Further, in cross-national studies, context comparability or differences need to be established and validated. For these reasons the methodologies used in institutional analysis are broader than those typically found in transportation studies where regression and operations research models often dominate. For example, in depth case studies, expert interviews, scenario analysis, qualitative modeling, focus group interviews and historical interpretive analysis, to name a few, are important methods in institutional analysis.

Despite the complexity of the institutional variable and the need to focus on more interpretive and qualitative methods, the nature of institutions does not negate using more formal and quantitative analyses. Questions about institutional differences between countries often lead to hypothesizes about differences in transportation flows and costs which can, of course, be examined using a variety of standard transportation models. So despite the softer nature of

institutions it may possible to structure institutional hypotheses using binary or categorical measures so that standard engineering, economic modeling, and analysis methods can be used and, therefore, the relative importance of institutions estimated. Thus, because it is possible to use both quantitative and yet emphasize qualitative methods more fully, it is possible to derive research questions that have been slow to surface in the past. The following list provides a few examples of the type of research questions that may be fruitfully approached from the perspective of institutional effects. These examples are:

- How to incorporate institutions explicitly into transport models so that their explanatory contribution can be better tested?
- How to test what regulatory regime produces better network economies?
- What is the impact of multi-jurisdictional control of transport networks on network efficiency?
- How do public and private sector polices interact and to what level of social or economic benefit?
- What benefits are achieved through policies for re-allocating authority to different levels of government?
- What is the user's perspective on policy and procedural interventions?
- What is the role of lobbying on transport systems operations, modal split, efficiency and distribution of access to transportation?
- What is the impact of separating the building of infrastructure from its operation?
- How does an institution operate and how does its operation impact transport?

Research into some of these questions would likely involve an almost totally interpretive or qualitative approach in order to obtain useful answers. Yet others hint at the possibility of adding an institutional variable into a more traditional transport model to conduct policy modeling and evaluation. In summary however, institutions are a different type of variable, in fact almost a meta variable, from most that have been traditionally used in transport analyses and thus trying to incorporate them into transport research poses methodological issues and problems.

The methodological issues and questions reviewed and discussed above immediately raise important and thorny data questions. For example, institutional data bases are often maintained by the organizations that enforce or make the rules. Thus, there is potential for bias, perhaps unintentional, in such data. Obtaining data for in-depth case studies often will involve obtaining access to and interviewing senior policy makers. Such interviews are often difficult to set up in a way that produces answers with insight. Further, it is often difficult to identify what informal institutions are and thus comparative analysis is necessary to obtain a benchmark definition or understanding with depth and perspective. But cross-country data are notoriously inconsistent, incompatible, and unreliable. One way to partially deal with this would be to use privately purchased data sets but often these have confidentially and propriety constraints. So these and other data issues are problems in the institutional approach to research, especially in transportation research.

Finally it is important once again to recognize that institutions have a positive role to play in the construction and maintenance of the transport system. This given, then there is a question in all transport decision making about institutional design or for that matter redesign. For sure we collectively have ideas about how the transport system can or could be improved and

this leads directly to the question of "how institutions that are constraining improvements can be transformed to achieve a more sustainable and productive system?" This in turn raises additional questions or issues such as the limits of institutional design and how to transport fruitful transport infrastructure innovations from one country to others. A recent Ph.D. Thesis by de Jong (1999) entitled *Institutional Transplantation* provides some interesting insight into these issues and questions. While this final paragraph does not strictly address a methodological issue, it suggests both additional constraints and possibilities that should be considered when adopting a methodological approach for institutional analysis in the transport sector.

6. Policy research directions: towards a research agenda

6.1 Institutions and Sustainability

In North America and Europe, institutional changes and regulatory reform have been successful to various degrees during the past several decades. For example, it has led to a very strong increase in efficiency and consumer welfare in aviation, whereas regulatory reform in the railway sector had mixed effects, ranging from positive in the USA to mainly negative in the EU. But it may be too early to draw final conclusions, because it appears that it often takes many years before the fruits of regulatory reform are reaped. In the field of eliminating trade restrictions at borders we also observe substantial welfare increases or benefits, although at the operational level there are still many impediments leading to inefficiencies in cross border transport.

A point of overall concern is the sustainability aspect of these institutional changes and regulatory reforms. Where it is possible to give several convincing examples of positive effects on efficiency, the environmental effects seem to be much less favorable, and often negative.

Institutional changes and regulatory reform had a strong focus on efficiency goals during the past several decades. An important research question is therefore how institutional change can be brought that promotes sustainability. An example is the institutional change needed to make the Kyoto protocol effective. As a special point of attention we mention the problem of how to deal with international transport in this context. Also the implementation of strategies of internalizing the full costs of transport in the aviation sector requires attention.

6.2 Regulatory reform in specific sectors

A field where regulatory reform has not led to attractive results is the European railway sector. The European share of rail in freight transport is much lower than in the US. Efforts to stimulate the emergence of efficient operators at the European level have had little effect thus far. One of the strategies to achieve this aim was the separation of infrastructure ownership and operations. But this tended to have adverse effects on passenger transport, which has predominantly a national orientation. This leads to the question whether complete separation of ownership and operations is necessary to achieve non-discriminatory access for freight. And in particular what can be learned from the North American experience of letting vertically integrated freight companies use each other's infrastructures.

In the aviation sector deregulation in the US and Europe had clear positive effects on consumer welfare due to the increase in competition. At the same time substantial developments took place in the form of the formation of a limited number of alliances. Further deregulation at the transatlantic market may well lead to further concentration tendencies. Of particular interest seems to be the case that one of the present strategic alliances might fail. This would imply that a duopoly results with two main supplying alliances at the world level. In this case the deregulation may have substantial adverse effects on welfare and thus sustainability due to an increase in monopoly power.

6.3 Institutional change and the role of borders

Borders have changed considerably during the past decades due to the emergence of NAFTA, and the expansion and deepening of the EU. The recent entry of Eastern European countries in the EU had huge impacts on waiting times for freight traffic at some borders implying a reduction of total transport times of up to 40%. However, there remain many more subtle barriers to spatial interactions and their meaning is not always well understood. These deserve ample attention in the research of border effects. Also, from a sustainability viewpoint it is interesting to observe that the reduction in barrier effects of borders seems to display some biases among transport modes. The cost reducing effects tend to be larger in aviation and road transport than in water and rail transport. Thus, the transport modes that are generally considered as more environmentally benign seem to benefit less from the reduction of border barriers than the modes that have strong negative environmental effects.

6.4 Subsidiarity; policy competition within the public sector

Subsidiarity is one of the cornerstones of EU. It says that public sector tasks should be allocated to a lower level of government unless there are obvious reasons to arrange things at a higher level. An economic analysis in the context of tax competition reveals that several problems can be identified that deserve more attention than they usually receive. For example, in the context of road tolls, there is the problem that tax burdens may be shifted to other parties, having adverse effects. In this context one may distinguish horizontal competition (between regions of the same level) and vertical tax competition (between region and a larger spatial unit). Within horizontal tax competition one may distinguish two cases: parallel and serial competition. Parallel horizontal tax competition in transport networks may lead to questions of how competition should be arranged to arrive at welfare improvements, although within this domain the problems seem limited. Serial horizontal tax competition leads to serious problems of abuse of monopoly power. Also vertical tax competition in the form of local price setting of for example parking charges versus regional or national price setting of tolls and fuel taxes has not yet received the attention it deserves.

6.5 Barriers to the implementation of innovative transport policies

There are many examples where innovative transport policies did not come off the ground due to various types of barriers. Or where the success of such policies presenting themselves as successful is debatable. An important reason concerns the equity aspects of such policies, and this calls for a thorough analysis of the equity and efficiency of alternative funding mechanisms and compensation schemes. Also legal barriers against innovative policies deserve more systematic attention. Finally the appropriate arrangements of responsibilities

within the public sector (central versus decentralized government) and between public and private sector are essential.

6.6 Private versus public roles in transport

Transport activities, and in particular the supply of infrastructure usually leads to an involvement of both the private and the public sector. In many countries various arrangements of public and private roles have been tried, and it appears that the results are mixed and do not point at unique best arrangements. Of particular relevance is the question how these arrangements can best be made at a network level, as opposed to the level of individual projects. Other relevant questions concern issues of risk shifting between public and private sector and the possibility to incorporate external cost pricing in these arrangements. Also the theme of measurement of quality of infrastructure output is essential given its role in incentive setting.

6.7 Themes for future international Transatlantic research co-operation.

Promising fields of future cross Atlantic research co-operation in the field of institutions and regulation include:

1. Regulation of aviation in particular its potential effects on concentration
2. Regulation of rail, in particular the pros and cons of vertical integration
3. Public transport subsidies, in particular impacts of user side subsidies in public transport
4. Vertical tax competition in transport, for example the trade-offs between local parking policies and regional tolls.
5. Barriers to environmentally friendly transport policies, in particular how to deal with the equity problems between winners and losers, compensation?
6. Public-private finance arrangements
7. The remaining barriers to trade after the NAFTA and EU expansion.

So there are many opportunities and for that matter demanding institutional problems and issues begging for serious attention. In fact it is so large that it raises questions about where to start and which issues if attacked are likely to yield the greatest benefits. These are not easy questions to answer, however there are some guidelines. First, priority should go to situations where the existing experience and knowledge base is high or relatively well developed. Second, issues where results of research might provide catalytic direction to improving sustainability are important. A third priority is where research can be reasonably believed to raise the probability for improving standards (e.g., safety). And finally, research that can or will likely yield improvements in institutional research measurement is important.

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